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Lewis Research Center



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Improved Method for Reclaiming Vacuum Diffusion Pump Oil

The problem:

Conventional methods for reclaiming contaminated vacuum diffusion pump oil are relatively ineffective or expensive.

The oil is chemically a pentaphenyltrimethyltrisiloxane having a molecular weight of 546 or a tetramethyltetraphenyltrisiloxane having a molecular weight of 484. When the oil cracks, it may become a trimer and/or heptamer.

Some methods do not remove compounds of volatile contaminants. Other methods process only small batch quantities, require specialized laboratory type equipment, and involve exacting chemical operations.

The solution:

A high vacuum centrifugal molecular distillation system that rapidly reclaims the oil in a continuous operation and restores it to a high level of purity.

How it's done:

The high vacuum centrifugal molecular still centrifugally separates volatile contaminant compounds from the pure oil at their individual respective evaporation temperatures. Preheated distillant feedstock is metered onto a heated rotating evaporator disk where separation occurs. The light-end contaminant vapors are condensed on the cool inner surfaces of the bell jar. The pure oil and heavy-end compounds are not vaporized and are spun off the rotating disk by centrifugal force, caught in a water cooled gutter, and collected as a residue. Final cut distillation is performed in a similar manner except that the pure oil is vaporized, condensed, and recovered as a distillate with the heavy-end contaminants being separated as a residue.

Notes:

1. Contaminated pentaphenyltrimethyltrisiloxane silicone pump oil (used for 3000 hours) has been successfully reprocessed by high vacuum centrifugal mole-

- cular distillation. Of 469 kg (1031 lbs) reprocessed, 335 kg (736 lbs) (71.5%) were recovered, and used to achieve a vacuum of 1.65×10^{-6} torr with a single stage glass diffusion pump vacuum system, compared to 1×10^{-6} torr with new oil. An ultimate vacuum of 2.8×10^{-9} torr was achieved utilizing recovered oil in a multi-stage glass diffusion pump vacuum system, compared to 2×10^{-9} torr achieved with new oil.
2. Utilizing two or three such centrifugal-molecular stills in series would reduce the reprocessing period correspondingly. Using larger molecular stills would further reduce the reprocessing time.
3. A high vacuum molecular wiped-film still may also be used successfully with this new process.
4. By this new method, reprocessed oil is 1/3 to 1/4 the cost of new oil.
5. Documentation may be obtained from:

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Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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